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TUMOR OF THE CEREBELLUM WITH MONOCULAR HEMIANOPIA.

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THE carefully studied clinical history and post-mortem results of every case of brain tumor are possessed of interest, whether the morbid growth has been attended by symptoms so slight as scarcely to attract attention, or whether its presence has been manifest by evidences so clear as to make a diagnosis comparatively easy both as to extent and situation of the disease. In the former case we find that large areas of certain portions of the brain may be destroyed during life without giving rise to marked symptoms; in the latter other parts resent injury by invariable and characteristic manifestations. In both something of the function of different regions of the brain may be learned. The following case of tumor of the cerebellum with monocular hemianopia is specially interesting in connection with the published histories of lesions of this portion of the brain.

Case.—Elizabeth B., æt. thirty-two, married, housework, was delicate and nervous. Her father, mother, and eight brothers enjoyed good health. So far as she knew none of her relatives had suffered from cancer, phthisis, or nervous affections. She had never had convulsions, and was well until her ninth year, when she contracted scarlet-fever. Convalescence was slow, and she was left deaf on the right ear. There was no history of chronic otorrhœa. At the age of nineteen she was married. Her husband, whom she nursed and slept with during his illness, died six years later of consumption. During this union she conceived twice but aborted each time about the third month. When she was twenty-four years old she had an attack of inflammatory rheumatism lasting nine weeks. During the last few years her health had not been good. She had suffered from indigestion and some uterine ailment. At her menstrual periods she had had left-sided migraine. In November, 1882, she was married the second time.

At that time she was feeling tolerably well, but soon after this marriage she began to suffer from severe and more or less constant headache.

The seat of pain changed from time to time. Sometimes it was in the back of the head, at others in the right or left side, but most frequently it was complained of in the top and frontal region. In February, three months after her marriage, the right eye became very painful, and the right arm and leg numb. The sensation of flashes of light were noticed in the eye when the lids were closed. At that time vision was very poor in the right eye, but subsequently it improved slightly. Soon after the beginning of the trouble in the right eye the left became similarly affected, but vision in this eye did not improve. Her last menstrual period occurred in April.

Shortly after the cessation of the menstrual flow, she began to vomit early in the morning, and sometimes during the day. The vomiting was never connected with taking food. By June she began to be troubled with vertiginous sensations when in the erect posture. Pain in the top and left side of the head was quite severe and almost constant. When she was admitted to the hospital of the Jefferson Medical College, in the latter part of July, vomiting and headache were the most prominent symptoms complained of.

Assisted by Dr. Parrott, one of the resident physicians of the hospital, I made the following observations of her condition soon after her admission into the medical ward.

She was pale, anæmic, and much emaciated. There was no apparent special cachectic appearance. No tremor or twitching of the muscles was observed. Grasp of the left hand fairly good, that of the right greatly diminished. Walking seemed at first attempt impossible, but by persuasion she was able to walk a few steps between two assistants. The difficulty in locomotion appeared to be due to several causes : want of confidence in her ability to keep from falling, the paretic condition of the right leg, and ataxic state of the muscles of both legs. By a strong effort of her will she was largely able to overcome the ataxia. Walking with eyes shut was more difficult than with eyes open. After considerable effort on her part, she succeeded, with closed eyes, in turning around, and in standing erect while her feet were close to each other. With closed eyes it was impossible to get her to walk forward or backward unless she was partially supported by two assistants. She was kept in the erect posture only a few minutes, but the exertion brought on such a degree of prostration, attended by pallor, nausea, and vomiting, that I feared to again test her ability to walk. This attack of vomiting lasted, with great distress, more than an hour. Electro-muscular contractility to the faradic current was nearly equal on each side, and slightly increased over the normal. Patellar reflexes were diminished, but about equal on both sides. The tongue in forced protrusion deviated slightly to the left. Facial muscles appeared to be unaffected. Speech was slow and hesitating, but articulation good. Left pupil normal, right slightly dilated. Both reacted to light, but the left to a greater degree.

Special Senses.—Sensations of pain, touch, and location were equal on both sides and well preserved; hearing, in right ear destroyed since childhood, in left fairly good; smell unaffected; taste, abolished on the right side, normal on the left; sight—with right eye fingers were counted at ten feet, with left at six feet. The field of vision in the right eye was good, but in the left hemianopia of the temporal side existed and apparently extended up to about the median line. On examining the eyes with the ophthalmoscope pronounced optic neuritis descendens was found in both eyes. In the left eye the disc was greatly swollen, the veins were tortuous, the arteries narrowed, and several small recent hemorrhagic spots around the papilla existed. In the right eye the disc was not as prominent as in the left, but it was lighter in color; the veins were not congested, but the arteries were smaller than normal. In this eye (the right) the stage of acute papillitis had passed. On several subsequent occasions I re-examined the field of vision in each eye, but found no appreciable change from that present at the first examination. No incontinence of urine or fæces. Bowels slightly constipated. Urine contained neither albumen nor sugar. The quantity of urine varied greatly from day to day, but at no time was there a condition of polyuria. Pain in the head was constant, and much of the time very severe. It was located most frequently in the front and top of the head, but when complained of on the sides it was usually worse on the left. Occipital region had not for some time been the seat of pain. During the first week of August she complained of shooting pains in the legs and left arm, and occasionally of pain in right or deaf ear. There was no pain in stomach or back.

Mind was clear, but she was hysterical and exceedingly emotional. To such a degree were the emotional faculties manifest that had there been no ocular lesion there would have been great danger of mistaking the case for one of pure hysteria. Indeed a very careful physician of many years' experience, who had examined her the day before I saw her, not knowing the condition of the eyes, pronounced the woman's condition to be pregnancy complicated by hysteria. This he did after he had been apprized of the fact that another physician had diagnosticated brain tumor. She vomited three or four times daily. An attack of nausea, which would frequently be followed by vomiting, could be brought on by her looking intently at an object for a few minutes. The thoracic and abdominal viscera were apparently healthy. The womb was enlarged and contained a fœtus at about the middle of gestation. The fœtal heart-sounds were heard the first week in August. During August the urine became very alkaline, and contained considerable pus and mucus. By the last of the month micturition at the close of each effort to empty the bladder became painful. August 6th the following temperature observations were made. The weather was clear, temperature in shade, 78°.

TEMPERATURE.

Axillary, R 98.6° ; L 98.6°.

Head :

Anterior frontal station,	R 98.4° ;	L 98.4°.
Posterior “ “	R 98.5° ;	L 98.6°.
Superior “ “	R 98.4° ;	L 98.4°.
Parietal “	R 99.2° ;	L 98.6°.
Rolandic “	R 98.8° ;	L 99.1°.
Occipital “	R 99.4° ;	L 99.1°.
Posterior central “	99°.	
Anterior “ “	99°.	

During August and September the progress of the disease was gradual, and no change in the symptoms was noted beyond increasing difficulty to stand, severer paroxysms of headache, and development of mental aberration during the latter part of the afternoon and early evening. At these times she sobbed, cried, and talked incoherently. Early in October she was transferred to the Woman's Hospital. About the middle of December she became unconscious, and on the 24th of the same month uterine contractions commenced. The next day shortly before labor was completed she died. The child was rapidly delivered by the forceps, but it was still-born.

Through the kindness of Dr. Emma V. Boone, pathologist to the Woman's Hospital, I obtained the morbid growth found in the brain, with a short account of the post-mortem made by her. The patient was admitted to the Woman's Hospital at so late a stage of the disease that she was unable to give a connected history of herself. Dr. Boone, who never saw the woman until after her death, knew nothing of her history, and did not expect to find any thing in the brain peculiarly interesting. This apology is due to Dr. Boone, who was surprised to learn that the case had been carefully studied early in the disease.

"Autopsy fifteen hours after death : Rigor mortis complete. On opening the cranium, the dura mater was found to be congested and thickened over the convexity of the brain. Longitudinal sinus contained dark coagulated blood. Left side of pia mater markedly congested (*post mortem* ?). Increase of fluid in both lateral ventricles. On cutting through the tentorium, a nodular tumor, the size of a large horse-chestnut, was found resting on the upper surface of the right lateral hemisphere of the cerebellum. Other portions of the brain appeared normal. The optic nerves were not critically examined. Thoracic cavity : On the right side pleuritic adhesions were extensive, and the lung markedly congested. Left lung normal. No increase of pericardial fluid. Right ventricle of heart occupied by a fibrinous clot ; left ventricle contained dark clotted blood. Abdomen : Uterus extended to umbilicus. Placenta, which was undelivered, showed signs of degeneration. Ovaries in iliac fossæ. Spleen soft and friable. Left kidney was somewhat enlarged, its capsule abnormally adherent, and the ureter, dilated at its upper portion, contained pus. Right kidney was larger than the left, and its cortical substance, slightly decreased, was the seat of several small abscesses. Its pelvis and ureter were dilated and contained pus. Vessels of stomach were injected. Liver was pale and presented evidences of fatty degeneration."

The tumor was found, on microscopic examination by Dr. Formad, to be sarcomatous, of the spindle-cell variety.

Remarks.—Monocular hemianopia, which was present in the case just reported, is rare, and peculiarly interesting in connection with brain tumor. The most frequent forms of hemianopia are those in which both right or both left sides of the retinæ are blind ; next in frequency are those in which the temporal halves of the fields are blind. The least frequent and very rare are cases in which the nasal sides of the fields are absent. In the first variety, in which the homonymous sides are affected, the blind fields are usually sharply defined and reach up to the median line, but in cases of nasal or temporal blindness the fields are apt to be irregular—(Noyes, " Diseases of Eye "). According to Ferrier's first conclusions (Ferrier, " Functions of the Brain," 1876), the region of the angular gyrus is the psychological seat of vision, but the riper and repeated work of Munk, together with the investigations of Wernicke and Stilling, and the subsequent observations of Ferrier, point very conclusively to the cortical substance of certain portions of the occipital lobe as the centres of vision.

Munk's recent conclusions are given as follows :

" 1. The occipital lobes of the brain are necessary for the perception of visual impressions. Destruction of both occipital lobes produces total and permanent blindness.

"2. Each occipital lobe is in functional relation with both eyes in such a manner that corresponding halves of both retinal areas are projected upon the cortex of the lobe of the like-named side; *e. g.*, destruction of the left lobe produces loss of function of the left halves of both retinæ.

"3. On the cortex of each occipital lobe the anterior segment corresponds to the upper half of the retinæ; the posterior to the lower half; the external half to the temporal half of the eye of the same side"—(Starr, "Visual Area in the Brain," *American Journal of the Medical Sciences*, Jan., 1884). In the article just referred to Dr. Starr very industriously collected the reports of twenty-seven cases of lesion of the occipital region in which blindness of one half of each retina occurred. In every instance the right halves of the retinæ were involved when the left occipital region, or fibres leading thereto, were affected, and *vice versa.* It is only necessary that I should call attention to the fact, established by researches in anatomy, pathology, and experimental physiology, that hemianopia may result from a lesion in the cortex of the posterior occipital lobe, the intermediate ganglia, viz., the thalamus, the geniculate and quadrigeminal bodies, or in the optic nerves themselves.

Monocular hemianopia, according to Noyes ("Diseases of the Eye"), can take place only by lesion of one nerve in front of the chiasm. He states that Mauthner reported one such case without autopsy. In the case that forms the subject of this article the temporal side of the field of the left eye was absent; the field of the right eye was not contracted. The blind area was sharply defined and reached up apparently to the median line. It is not probable that I was mistaken in my observations. I repeatedly examined the fields and found them as stated. On one occasion Dr. Fox, who knew nothing of the results of my examination, at my request examined the eyes. He reported monocular hemianopia of the left eye. I regret that the optic nerves were not more critically examined after death, but in the absence of any gross lesion of the nerve beyond the chiasm, and in the presence of a tumor in the posterior region of the brain, in such a position as to produce pressure upon the occipital lobe of the right side, corresponding in this respect to the blind side of the retina of the left eye, I am inclined to attribute the monocular hemianopia to the presence of the morbid growth found just beneath the tentorium.

The electro-muscular contractility was increased, but the patellar reflexes were diminished on both sides. I am not aware that the condition of the reflexes in cerebellar lesions attended with ataxic symptoms has been thoroughly studied. Granting that they are usually increased, which I think is doubtful, the condition of the patellar reflexes in the present case could be accounted for from the exhausted state of the patient invariably induced by exertion, and that only to an extent sufficient for a thorough examination. I have observed in many persons who were in apparently good health the knee jerk to be greatly diminished by exhausting walks.

I had an excellent opportunity to study the influence of the will over the higher reflex centres. On first attempting to walk, after I first saw her, she was apparently unable to do it, but with an assistant, who gave her no physical support, on each side of her, and being persuaded that she could walk, she did so, and even succeeded with closed eyes in turning around and in standing erect with feet placed against each other. The exertion required for her to coordinate her muscles, even in simple movements, was great, and caused considerable exhaustion. Looking intently at an object, holding the arms out from the body, or performing slight movements for a minute or two at a time only, produced such exhaustion that nausea and vomiting followed.

In this connection the recent and interesting experiment of Prof. Luciani, who has succeeded in removing the entire cerebellum of a dog without destroying the life of the animal, will help to explain why the patient was able to overcome, by will-force, her ataxia in walking to a great extent. Herbert Spencer, Jackson, and Ross believe that the cerebellum has a tonic invigorating influence over the muscles. The experiment of Luciani tends to confirm this view. He found, after the removal of the cerebellum, during the stage of irritation resulting from the operation, that symptoms of incoördination were present, but as recovery advanced, "however, these disappeared, and a kind of muscular asthenia or loss of tone took their place"—(*Medical Record*, Dec. 27, 1884).

If the sense of taste is located, as inferred by Ferrier, in a portion of the temporo-sphenoidal lobe (subiculum) of the opposite side, I have no theory to offer in explanation of the absence of the sense of taste on the right side of the tongue in the present case, except it occurred through pressure on the chorda tympani nerve, which is the gustatory nerve to the anterior portion of the tongue.

The cerebral temperature observations in this case corroborate the conclusions at which I had arrived from the study of cerebral surface temperature in other brain diseases, viz.: "that a high head temperature extending over a considerable period, while the axillary heat was normal or below, pointed to organic lesion of the brain or its membranes"; and further, that I "was not yet satisfied that surface thermometers would enable us to locate lesions in different portions of the brain with sufficient accuracy for general diagnostic or therapeutic purposes"—("Transactions of the College of Physicians of Philadelphia," third series, volume vi.).